CONTAINER WITH SECUREMENT FOR A CAP

TECHNICAL FIELD

The present invention relates to containers, and particularly relates to containers for supplying beverages to consumers. The invention has particular utility for the storage and supply of carbonated and other sparkling drinks, but is also suitable for use with other types of drinks.

BACKGROUND ART

For many years there has been a desire among drinks suppliers and container manufacturers to provide practical wide-mouth beverage supply containers which consumers may drink from comfortably in the same manner as from a drinks glass or other drinking vessel. Despite the tremendous advantages that such a beverage container would provide for drinks suppliers, container manufacturers and consumers alike, no successful beverage container that fulfils these aims has yet been produced. Consequently, bottles and ring-pull cans currently remain the main practical beverage supply containers for consumers. This is because there are significant technical problems associated with wide-mouth containers to overcome, and no practical solution to the problems has successfully been devised.

One of the aims of the present invention is to provide a practical beverage container.

Another aim is to provide a container with a closure which seals the opening of the container yet can be removed relatively easily by hand.

The invention has particular utility as a wide-mouth beverage container. However, at least some aspects and embodiments of the invention need not be a wide-mouth container, but can instead be a narrow-mouth container (as explained herein).

SUMMARY OF INVENTION

A first aspect of the present invention provides a container comprising a container body including an opening, preferably a wide-mouth opening, wherein the interior of the container body includes at least one securement means by which a cap may be releasably secured to the container body to close the opening.

The (or each) securement means preferably is provided on an internal surface of the container body. The container body does not therefore need securement means projecting from its external surface so may be formed with a smooth external surface (beneath any lip provided around its opening).

The beverage container preferably includes the cap that may be releasably secured to the container body to close the opening. The cap preferably includes at least one securement means by which the cap may be secured to the container body, by engagement with the securement means of the container body. The (or each) securement means of the cap preferably is provided externally on the cap, especially on a circumferential exterior surface of the cap (e.g. a bore seal or other plug portion of the cap which fits within the interior of the container body). Preferably, the cap also extends across the rim of the container opening and has a skirt portion which extends down over the exterior of the container, e.g. over a lip of the container.

The cap is releasably securable to the container body preferably by means of a threaded engagement with the container body. Consequently, the (or each) securement means of the container body and/or the cap preferably is a thread. The threaded engagement may, for example, comprise a bayonet-style engagement or alternatively a screw-threaded engagement. The term "thread" as used herein includes (at least in the broadest aspects of the invention) continuous and discontinuous threads, (e.g. continuous and discontinuous screw threads), and bayonet-style threads, for example. Threads used in relation to the invention may, for example, comprise a plurality of segments (each thread segment

comprising a said securement means), in which case the thread may either be discontinuous, or it may be substantially continuous because the effect is that of a substantially continuous screw thread pattern. One or more threads used in the invention may have a single helix angle, or a plurality of differing helix angles. The thread may comprise projections on the internal surface of the container which engage with grooves formed on the cap or vice versa.

The opening of the container body may be a narrow-mouth opening, e.g. a bottle-type opening. Such an opening may have a diameter of less then 40mm, for example. Conventional standard bottle mouth sizes include diameters of 28mm and 38mm, and the opening of the container body of some embodiments of the present invention may have such a diameter.

Alternatively, the opening of the container body may be a wide-mouth opening. By a "wide-mouth opening" is meant (at least in its broadest sense) an opening of a size suitable for a person to drink from the container in the same manner as from a drinks glass or similar drinking vessel. That is, in its broadest sense, the wide-mouth opening of the container (for embodiments of the invention having a wide-mouth opening) generally renders the container suitable as a drinking vessel from which a beverage supplied in the container may be conveniently drunk (in contrast to conventional narrow-necked bottles and ring-pull cans which generally are not regarded as comfortable drinking vessels). In practice, this requirement means that the diameter of the wide-mouth opening of the container will normally need to be at least 40mm, preferably at least 45mm, and more preferably at least 50mm. Additionally, an excessively wide opening is generally difficult for the consumer to drink from, and thus the wide-mouth opening preferably has a diameter no greater than 150mm, more preferably no greater than 100mm, and especially no greater than 80mm. A particularly preferred diameter range for the wide-mouth opening is 50 to 80mm, and examples of particular preferred diameters included 53mm and 63mm.

The container body preferably has no thread or thread segments on its exterior. Consequently, the container body preferably is comfortable for a consumer to drink directly from the container body.

A wide variety of thread forms for securing the cap to the container body, is possible. As indicated at the beginning of this specification, at least some embodiments of the invention are intended for the storage and supply of carbonated and other sparkling drinks, for example beers, ciders, sparkling wines (including champagne), other fizzy alcoholic beverages, and non-alcoholic fizzy and sparkling beverages, including sparkling water and carbonated soft drinks. For such beverages, it is preferred for the engagement between the cap and the container body to include provision for gas venting upon partial removal of the cap from the container body, to prevent so-called "missiling" of the cap whereby the cap is violently ejected from the container body as the container is opened, by the gas pressure of the contents of the container.

Advantageously, therefore, the container body and the cap may include means, preferably engageable elements, to block or restrict removal of the cap from the container body beyond an intermediate position (between fully secured and fully released) when the cap is under an axial pressure in a direction emerging from the container body. Such blocking or restricting means (e.g. engageable elements) may comprise parts of the thread on the cap and the container body. Additionally or alternatively, the means to block or restrict removal of the cap from the container body may comprise one or more tethers linking the cap directly or indirectly to the container body. For example, one or more such tethers may link the cap to a tamper-evident band or other part attached to the container body.

Preferably the cap and the container body are constructed and arranged to provide a vent for venting gas from the container body at

least when the cap is in an intermediate position (between fully secured and fully released).

Examples of suitable thread constructions and arrangements are known (only for threads provided on the exterior of container bodies), e.g. from international patent applications WO 95/05322, WO 97/21602, WO99/19228 and WO 03/045805, the entire disclosures of which documents are incorporated herein by reference.

Documents WO 97/21602 and WO 03/045805 each disclose screw threads having regions of differing helix angles (incorrectly referred to in those documents as the "pitch" of the screw threads). Screw threads of these types may, in some embodiments, be used for the container body and/or cap of the present invention.

Preferably, the thread of the container body or the cap comprises a plurality of first thread segments. The thread of the other of the cap or the container body preferably comprises a plurality of second thread segments. The second thread segments preferably have lower thread surfaces, the helix angle of the lower second thread surface being relatively low, at least in a first region. Preferably the helix angle of the lower second thread surface is relatively high in a second region displaced from the first region in an unscrewing direction. Such a thread arrangement may combine the advantages of conventional helical screw threads and bayonet-style threads. This is because the use of a screw thread has the advantage that, in comparison to a bayonet-style thread, only a relatively small axial force is required to secure the cap on the container body, but the transition to a relatively low helix angle region of the thread (from a higher helix angle region) as the cap is screwed onto the container body means that this region can provide greater security (akin to a bayonet fitting) against accidental unscrewing of the cap from the container body under an axial force from pressurized contents of the container than could be the case with a conventional helical screw thread having a single helix angle.

The differing helix angle screw thread embodiments described above may also include the means (e.g. engageable elements) to block or restrict removal of the cap from the container body beyond an intermediate position when the cap is under an axial pressure in a direction emerging from the container body, as also described above. The engageable elements preferably comprise a step or recess formed in the lower second thread surface to provide a first abutment surface, and a second abutment surface on a first thread segment against which the step or recess may abut. Preferably the helix angle of the lower second thread surface is relatively low in a third region adjacent to the step or recess in the lower second thread surface.

By "lower thread surface" is meant the thread surface that prevents the axial separation of engaging threads under axial forces directed to cause such separation. For example, in relation to a thread on the container body, the "lower thread surface" is the surface of the thread further from the wide-mouth opening. For embodiments of the invention in which the cap includes a bore plug carrying a thread for engagement with the container body, the "lower thread surface" of the thread is the surface further from the bottom (open end) of the bore plug.

Preferably the thread regions of relatively low helix angle have a helix angle of no greater than 10 degrees (with respect to a plane in which the opening lies). More preferably the helix angle of the low helix angle regions is no greater than 7 degrees, especially no greater than 6 degrees. Preferably the helix angle of the thread regions of relatively high helix angle is greater than 10 degrees, for example in the range 12 to 20 degrees.

The screw threads by which the cap and the container body mutually engage preferably each comprise a plurality of segments. The segments of the thread on the container body preferably are shorter than the segments of the thread on the cap, but the converse may instead be

the case. The shorter thread segments preferably each extend no more than 30 degrees, more preferably no more than 15 degrees, especially no more than 10 degrees of arc around the internal circumference of the container body (or alternatively around the external circumference of the cap). The threads on the cap and the container body which secure the cap and the container body together preferably may, in some embodiments, be substantially as disclosed in WO 03/045805 (except that in that document the threads on the container body are exterior threads, and those on the cap are interior threads, whereas in the present invention the converse is the case).

As mentioned above, in some preferred embodiments of the invention, the threaded engagement between the cap and the container body may advantageously be a bayonet-style engagement. The (or each) bayonet thread preferably comprises a substantially circumferentially-extending part and a substantially axially-extending part. The substantially circumferentially-extending part of the thread provides the securement of the cap to the container body, by preventing axial movement between the cap and the container body; it may include a slight incline such that it extends over a small axial distance along its circumferential length. The substantially axially-extending part of the thread enables a protrusion engageable with the thread to become engaged therewith and/or disengaged therefrom.

Preferably a plurality of bayonet threads is provided. Thus, the number of bayonet threads preferably is at least two, more preferably at least four, even more preferably at east six, e.g. eight or more. The bayonet threads preferably are substantially evenly spaced around the circumference of the cap or container body.

In some preferred embodiments of the invention, the cap and the container body include engagement means to secure the cap on the container body by substantially preventing rotation of the cap with respect to the container body under the influence of a force acting in a direction

emerging from the container body substantially perpendicular to a plane in which the wide-mouth opening lies. In particular, the engagement means preferably prevent the initiation of such rotation of the cap with respect to the container body, when the cap is fully secured on the container body. The engagement means may, for example, comprise one or more protruding and/or recessed members of the cap and the container body. The engagement means may comprise part of the threaded engagement between the cap and the container body (i.e. part of their threads). Alternatively, the engagement means may be spaced apart from the threaded engagement. For example, the engagement means on the container body may be below the thread, on the opposite side of the thread from the opening. The engagement means on the cap may be lower on a bore plug of the cap than the thread of the cap. The engagement means are arranged to prevent accidental "backing off" (i.e. unscrewing) of the cap from its fully closing and sealing position on the container body. Examples of some forms of such engagement means are disclosed in WO 91/18799, the entire disclosure of which is incorporated herein by reference. The engagement means disclosed in that document are provided on the exterior of the container body and on the interior of the cap, whereas in the present invention the converse may be the case.

The (or each) engagement means of a bayonet thread may for example comprise a stop member, e.g. a step, ledge, obstruction or projecting member of the bayonet thread over which a respective protrusion (engaged with the bayonet thread) must pass in order to disengage the protrusion from the bayonet thread. Most preferably, the (or each) stop member of the bayonet thread comprises a step between two axially differing levels of the bayonet thread (the axis being an axis of the circumferentially-extending thread, and being the same as the axis extending through the opening of the container body when the cap is secured to the container body).

The cap preferably includes tamper-evident means, for example a tamper-evident band or ring. The tamper-evident means provides an

indication that the cap has previously been released from the container body. The tamper-evident means is advantageously provided on the exterior of the cap.

The container preferably includes at least one sealing member to form a seal between the cap and the container body when the cap is secured thereon. The (or each) sealing member may, for example, form part of the cap and/or the container body, or it may be a separate member. Preferred sealing members include sealing flanges and/or other sealing members, for example gaskets and the like. Another possible sealing member is a membrane seal, for example comprising a metal foil seal (e.g. formed from aluminium foil), which may optionally be provided with one or more polymer layers on one or both major surfaces thereof. The foil seal may provide an excellent gas barrier, for example. Advantageously, the use of a metal foil seal may enable the formation of a seal by induction heating, e.g. by bonding one or more polymer layers to the container body and/or to the cap. The foil seal or other membrane seal may be provided on the cap and/or the container body and/or separately.

The container and its components may be made from any suitable material, including metal and/or glass and/or polymer material. Polymer materials are generally preferred for the cap, especially polyolefins, e.g. polyethylene or polypropylene. The container body preferably is formed from glass or polymer material, especially a polyolefin, e.g. polyethylene terephthalate (PET). The polymeric components preferably are formed by moulding, especially injection moulding and/or blow moulding.

BRIEF DESCRIPTION OF DRAWINGS

Some preferred embodiments of the invention will now be described, by way of example, with reference to the accompanying drawings, of which:

Figure 1 shows two beverage container embodiments of the invention;

Figure 2 shows a detail of one of the embodiments of Figure 1, with the cap separated from the container body;

Figure 3 shows the same detail as Figure 2, with the cap secured to the container body;

Figure 4 shows the detail of Figure 2 in cross-section;

Figure 5 shows the detail of Figure 3 in cross-section;

Figure 6 shows a detail of the second embodiment of Figure 1, with the cap separated from the container body;

Figure 7 shows the detail of Figure 6 in cross-section;

Figure 8 shows the detail of Figure 7 with the cap secured to the container body;

Figure 9 shows, schematically, three views of another embodiment of the invention;

Figure 10 shows in detail a further embodiment of the invention;

Figure 11 shows, schematically, three views of another embodiment of the invention; and

Figure 12 shows three views of a further embodiment of the invention.

BEST MODE OF THE INVENTION

Figure 1 shows two containers, 1a and 1b, according to the invention. Each container 1 comprises a container body 2 and a cap 3 secured to the container body to close a wide-mouth opening provided in the container body. The container bodies are transparent, showing internal screw thread arrangements indicated generally by reference numeral 17, which are shown in greater detail in subsequent drawings, and described below. Threads are provided on the interior of the container body 2 and on an external surface of the cap 3.

Figure 2 shows a detail of embodiment 1a of Figure 1, with the cap 3 separated from the container body 2. The cap 3 is releasably securable to the container body 2 by means of the threaded engagement 17. Additionally, as supplied by the drinks supplier (with a beverage contained in the container) the cap 3 includes a tamper-evident band 19 on a skirt portion 3a thereof. Breakable connections (not shown) between the tamper-evident band 19 and the remainder of the cap 3 must be broken in order to remove the cap 3 from the container body 2. (The detail shown in Figure 2 is prior to initial securing of the cap to the container body by the drinks supplier, hence the tamper-evident band is attached to the cap despite the cap being separated from the container body.)

The screw threads on the container body 2 and cap 3 each comprise a plurality of thread segments (referred to more generally herein as "securement means"). As shown in Figure 2, the threads are "eight-start" threads (i.e. there are eight start positions for the thread around the circumference of the container body/cap). The eight first thread segments 21 on the container body are short in length, each extending approximately 10-15 mm around the internal circumference of the container body. The lower thread surface of the first thread segments has a helix angle of approximately 6 degrees (i.e. a low helix angle), and the upper thread surface has a helix angle of approximately 13.5 degrees (i.e. an intermediate helix angle). As explained earlier in this specification, the "lower thread surface" in this context is the surface of the thread on the

container body that is further from the wide-mouth opening, and the "upper thread surface" is the surface closer to the wide-mouth opening.

The eight second thread segments 23 on the cap 3 are provided on a bore plug 25 of the cap 3, which is received within the container body when the cap is secured thereto. The second thread segments 23 on the bore plug 25 of the cap 3 each have a lower thread surface 27 and an upper thread surface 29. The "lower thread surface" in this context is the surface of the thread on the cap 3 that is further from the end of the bore plug 25 of the cap that extends the furthest into the container body. The upper and lower second thread surfaces define a substantially continuous generally helical path 31 between axially adjacent thread segments. The lower thread surface 27 of each second thread segment comprises a relatively low helix angle first region 33, a relatively high helix angle adjacent second region 35 (in an unscrewing direction) and a further relatively low helix angle adjacent third region 37 (in an unscrewing direction). The first and third regions each have a helix angle of approximately 6 degrees, and the second region has a helix angle of approximately 25 degrees. The average helix angle of the lower thread surfaces of the second thread segments is approximately 13 degrees.

The first and second thread segments also include provision for gas venting upon partial removal of the cap from the container body, to prevent "missiling" of the cap whereby the cap is violently ejected from the container body as the container is opened by the consumer, due to the gas pressure of the contents of the container, when the container holds a carbonated beverage. This gas venting provision takes the form of engageable elements on the first and second thread segments to block or restrict removal of the cap beyond an intermediate position when the cap is under an axial pressure in a direction emerging from the container body, and gas vents to allow the escape of gas from the container between the thread segments when the cap is in its intermediate position. The engageable elements of the thread segments comprise a step 39 on each of the second thread segments, and a leading edge 41 (leading in

the unscrewing direction) of each of the first thread segments. The gas vents comprise gaps 43 between second thread segments 23 and spaced apart extensions 42 of the second thread segments, as well as gaps between the axially adjacent thread segments in the helical paths 31.

When the cap 3 is fully screwed onto the container body 2 as shown in Figure 3, the lower thread surface of each first thread segment 21 is engaged with the relatively low helix angle first region 33 of the lower surface of a respective second thread segment 23. In this fully screwed-on position, a leading edge 44 (leading in the screwing-on direction) of the first thread segment 21 buts against a longitudinally-oriented edge 46 of the extension 42 of a respective second thread segment 23. The low helix angle of the first thread segment 21 and the first region 33 of the second thread segment means that there is little tendency for any internal gas pressure (due to carbonated contents of the container) acting on the cap and the container body to be converted into rotational motion causing the cap to unscrew from the container body. However, in order to ensure that there is no tendency for the cap to unscrew from the container body, the cap and the container body may include engagement means that substantially prevent such an "accidental" unscrewing motion. The engagement means may, for example, comprise protruding and/or recessed members 45 of the cap and the container body, and they may be spaced apart from the screw threads, as shown in Figure 2. (Alternatively, the engagement means may comprise protruding and/or recessed members of the screw threads themselves.)

In order to unscrew the cap 3 from the container body, a minimum initial unscrewing torque to overcoming the resistance of the engagement means 45 and the friction of the engaging thread segments is required. Subsequently, if the container contains a carbonated (or otherwise fizzy) beverage, the gas pressure in the container will tend to force the cap to unscrew until it reaches the intermediate position whereby the first thread segments 21 abut against respective steps 39 provided on the second thread segments. Once sufficient gas has vented from the container, the

cap may be pushed back towards the container body slightly to enable the first thread segments to clear the steps 39 and thus to release the cap from its engagement with the container body.

As shown in figures 2 and 3 and mentioned above, the cap 3 preferably includes a tamper-evident band or ring 19 that is severed from the remainder of the cap 3 when the cap is removed from the container body 2 for the first time. The tamper-evident band 19 is severed from the remainder of the cap 3 on removal of the cap from the container body 2, by virtue of a peripheral retaining lip 47 provided on the container body, which retains the band 19 on the container body.

Figure 4 shows the detail of Figure 2 in cross-section, and Figure 5 shows the detail of Figure 3 in cross-section. As can be seen most clearly in these figures, the end of the bore plug 25 that extends furthest into the container body 2 when the cap 3 is secured thereto, includes a sealing member 5 to form a seal between the cap and the container body. As drawn, the sealing member comprises a resiliently flexible fin that is integrally formed with the cap. (However, alternative sealing members and sealing arrangements are possible, including separate sealing members placed between the cap and the container body, for example at the wide-mouth opening of the container body.) The sealing member 5 seals against an internal flange 7 provided inside the container body beneath the thread segments 21 and members 45, against which the end of the bore plug 25 seats when the cap is fully secured to the container body, as shown in Figure 5.

Figures 6, 7 and 8 are equivalent to figures 2, 4, and 5, except they show embodiment 1b rather than embodiment 1a. Embodiment 1b is substantially identical to embodiment 1a, except that the cap 3 of embodiment 1b includes a large external skirt portion 9 that extends over the outer periphery of the container body 2 when the cap 3 is secured thereto. Consequently, the lip 47 provided on the periphery of the container body 2 to retain the tamper evident band is spaced further from

the wide-mouth opening in the 1b embodiment than in the 1a embodiment. Additionally, the bore plug 25 of the 1b embodiment extends further into the container body than does the bore plug of the 1a embodiment.

Figure 9 shows a beverage container 51 for containing a gas-pressurized beverage, comprising a container body 53 including a wide-mouth opening 54, a cap 55 to close the opening, a tether 57 by which the cap is indirectly attachable to the container body, and a retaining device 59 in the form of a tamper-evident band that is directly attachable to the container body. The cap 55 is arranged to close the wide-mouth opening 54 by means of a threaded engagement with the container body 53. In particular, the container body 53 includes a screw thread 511 on its internal surface (rather than the external surface), and a plug portion 513 of the cap 55 includes a screw thread 515 on its external surface (rather than on an internal surface of a skirt portion of the cap). Consequently, the exterior of the container body is free from screw threads and thus presents a consumer-friendly vessel from which consumers may comfortably drink the beverage supplied in the container.

Adjacent to the wide-mouth opening 54 of the container body 53 is a radially-outwardly projecting rim 517 of the container body. When the beverage-containing container is supplied to the consumer, the cap 55 and tamper-evident band 59 are secured to the container body, with the cap fully engaged to the container body by means of its threaded engagement, and the tamper-evident band trapped beneath the rim 517 on the exterior of the container body. In this closed configuration, which is shown in Figure 9(a), a sealing leading-edge 519 of the plug portion forms a seal with a corresponding sealing surface 521 provided on the interior of the container body at a position further from the opening 54 than the screw thread 511. Consequently, the container is tightly sealed by its cap 55. The tamper-evident band 59 is connected to the cap 55 via severable webs 523, and via at least one substantially non-severable tether 57. The (or each) tether 57 is flexible, and has a greater length

than each of the webs 523. The tether is in a generally "diagonal" configuration before the webs are severed, when the cap is fully engaged with the container body, as indicated in Figure 9(a). The diagonal configuration is due to the opposite ends of the tether, respectively where it joins the cap and the tamper-evident band, being off-set (i.e. out of alignment) with respect to each other. This is to allow relative movement between the cap and the tamper-evident band in the direction in which the cap is to be unscrewed (to open the container).

Figure 9(b) shows the container after an initial unscrewing movement of the cap 55 has been effected, sufficient merely to sever the webs 523 between the cap and the tamper-evident band 59. Consequently, this initial unscrewing movement is sufficient to provide tamper-evidence. The amount of unscrewing movement is indicated in the figure by the movement of the thread segment 511 of the container body, with respect to the screw thread of the cap. Because of the (small) relative movement between the cap and the tamper-evident band 59, the tether 57 is now in a "folded" configuration, because the opposite ends of the tether are in approximate alignment with each other, but the cap has yet to move axially with respect to the tamper-evident band. The cap has not moved axially because this initial movement of the cap is defined by a first region A of the thread 515 of the cap, which has a substantially horizontal orientation, i.e. a helix angle of substantially zero degrees.

The tamper-evident band 59 has been held in place on the circumference of the container body 53 while the cap 55 has been rotated with respect to the container body and the tamper-evident band, because a radially-inwardly directed protrusion 525 of the tamper-evident band is located with a radially-outwardly directed stop feature 527 provided on the exterior surface of the container body below the rim 517. This is indicated in the top view of Figure 9(a), which is a cross-sectional view of the container body on a horizontal cross-sectional plane through the container body immediately below the rim 517.

Once the components of the container are arranged in the configuration shown in the side view and the side cross-sectional view of Figure 9(b), with the tether 57 in its folded configuration, the resilience of the tether then pushes the tamper-evident band 59 downwardly, away from the cap and the rim 517. The relative dimensions of the stop feature 527 and the tether 57 are chosen such that this downward movement of the tamper-evident band moves the tamper-evident band clear of the stop feature (i.e. below it). Consequently, the cap and the tamper-evident band are now able to rotate together upon further unscrewing of the cap from the container body. The top view of Figure 9(b) actually shows the configuration after the tamper-evident band has moved clear of the stop feature and has rotated slightly with respect to the container body, such that the protrusion 525 now lies on the opposite side of the stop feature 527.

Once the configuration shown in Figure 9(b) has been reached, the cap 55 is forced away from the container body 53 and the tamper-evident band 59, along a second region B of the thread 515 of the cap. This second region B of the thread 515 of the cap has a steep helix angle, for example in the range 30-90 degrees (e.g. approximately 45 degrees as drawn). The cap 55 is forced along this second region of the thread by the gas-pressurization of the beverage contained in the container, and the cap is prevented from being ejected from the container body by the tether 57 and the tamper-evident band 59. The tamper evident band 59 is retained on the container body 53 by the rim 517, and thus the cap 55 is indirectly retained on the container body by the tether 57, which is attached to the tamper-evident band. The length of the tether 57 is such that at the maximum extension of the tether, as shown in the middle view of Figure 9(c), gas from the interior of the container is able to vent between the container body and the cap, via the wide-mouth 54 of the container.

Once the gas from the interior of the container 51 has safely vented to the atmosphere without the cap 55 being ejected forcefully from the

container body, the cap can be unscrewed further, such that the thread segments 511 on the interior of the container body move along respective third regions C of the thread 515 of the cap. The third regions C have a substantially zero helix angle, similarly to the first regions A. (In some embodiments (see for example figures 10 and 11), the third regions C may be omitted, such that the thread 515 of the cap comprises only first and second regions A and B. In such embodiments, the cap is retained on the container body during venting only by the tamper-evident band and the tether(s).) Because the protrusion 525 on the tamper-evident band is now clear of the stop feature 527, the tamper-evident band 9 rotates with the cap 55. This rotation of the tamper-evident band 59 causes the protrusion 525 to be forced along a ramp-shaped "lead-out" profile 529 arranged to bring the protrusion into radial alignment with the radially outer surface of the rim 517. Consequently, the tamper-evident band 59 can now be released from the container body 53 together with the cap 55. The removal of the cap 55 and the tamper-evident band 59 from the container body allows the consumer to drink the beverage directly from the container body via its wide-mouth 54.

Figure 10 shows a further embodiment of a beverage container according to the invention, comprising a container body 53 having a wide-mouth opening 54 and a cap 55 (shown part cut away) to close the opening. The container body 53 includes an internal thread 511 (i.e. a thread on its internal surface below the opening 54) comprising individual spaced-apart discrete thread segments. The cap 55 includes a thread 515 on the circumferential external surface of a plug portion 513 of the cap. The thread 515 shown in Figure 10 is similar to the thread 515 shown in Figure 9, but with the third regions C omitted, such that the thread 515 of the cap comprises only first and second regions A and B. In this embodiment, therefore, the thread 515 is substantially a bayonet thread comprising an inclined axially-extending region B and a circumferentially-extending region A. The circumferentially-extending region A of the thread 515 provides the securement of the cap to the container body, by preventing axial movement between the cap and the container body.

(The circumferentially-extending region A may, at least in some versions, include a slight incline such that it extends over a small axial distance along its circumferential length.) The inclined axially-extending region B of the thread 515 enables a thread segment or protrusion 511 on the interior of the container body to become engaged with and/or disengaged from the thread 515. The cap 55 preferably includes (as shown) a tamper-evident band 55 and tethers 57, the functions of which are as described above with reference to Figure 9. The container body 53 preferably includes protrusions 531 arranged periodically around its exterior circumference below a circumferential outwardly projecting rim or lip 517 (which defines the opening 54). The protrusions 531 preferably prevent the tamper-evident band 55 from rotating when the cap is rotated with respect to the container body, to release the cap.

Figure 11 shows three views (a) to (c) similar to those of Figure 9, for another embodiment of a beverage container according to the invention. This embodiment is similar to that shown in Figure 9, with the exception that the external thread 515 on the plug portion 513 of the cap 55 comprises only a substantially axially-extending region B and a substantially circumferentially-extending region A. Thus, the third region C of the Figure 9 embodiment is omitted. Consequently, the thread 515 shown in Figure 11 is a bayonet-style thread, in which the substantially circumferentially-extending region A of the thread 515 provides the securement of the cap to the container body, by preventing axial movement between the cap and the container body. (The substantially circumferentially-extending region A may, at least in some versions, include a slight incline such that it extends over a small axial distance along its circumferential length.) The substantially axially-extending region B of the thread 515 enables a thread segment or protrusion 511 on the interior of the container body to become engaged with and/or disengaged from the thread 515.

Figure 12 (views (a) to (c)) shows a container 51 according to a further embodiment of the invention. (In Figure 12, items similar to

respective items of the embodiment shown in figures 9 to 11 have the corresponding reference numerals.) Figure 12(a) shows a cap 55 and tamper-evident band 59 in the process of being engaged with a container body 53, in order to close and seal a wide-mouth opening 54 of the container body. The thread 515 on the plug portion 513 of the cap has a single non-zero helix angle and engages with a thread (not shown) provided on an internal surface of the container body 53.